TORREYA

Vol. 38 May-June, 1938 No. 3

A new genus and species of fossil Algae

Titus Ulke

GLOBULINEA, n. gen. n. sp. Ulke

Original Description.—The generic name GLOBULINEA has been here adopted to designate members of a group of calcified fossil algae, each of which, in mature stage at least, possesses a long and usually branchless, flexible, rope-like, stem or axis, fairly uniform in diameter for any given plant, built up of, or inclosing, a series of globular or rounded cylindrical cells or joints, like a chain of close-set beads, and occasionally exhibiting a thin transverse septum between adjacent cells or joints. (See Fig. 1.) Each stem appears to have been sheathed, at least partly, by a skin or epidermis, as evidenced by a faint line or groove along its length, though apparently absent, or worn off, in parts of the stems of slenderer (as if younger) plants, which then resemble a rope of contacting beads (Fig. 2). A tiny groove may often be observed around each bead-like cell, suggesting some sort of wall around it.

The larger sized stems are almost always stout and unbranched, while smaller stems, and young plants of this genus often show a few short branches or buds, as illustrated in Figs. 2, 3 and 4. The thallus in young plants does not appear to be divided by any transverse septa (Fig. 4). Stems and branches are usually curved, looping or undulating in form and occasionally curled up at their end (Fig. 3) or bent back at an acute angle. Distinct rhizoids have not yet been observed. The calcareous epidermis or walls do not show any evident structural pores.

In a single instance (Fig. 5), what may be a fruiting organ, terminating a branch, was observed.

Small lobate markings, associated with the "rope" and "bead-like" structures, suggest algal fronds, but have not been found definitely attached. Rarely the "beads" decrease in size in one direction, as in a budding algal branch.

Where best developed, the algae lie in zones parallel with the bedding planes in the Salem limestone (Mississippian) in which they occur, and their constituent material is essentially like that of the surrounding limestone, both in composition and in structure.

Type Locality.—The genotype, as well as the type specimen of my new species, *Globulinea giganteus* Ulke, n. sp., can be seen exposed on the weathered top face of the 2nd lowest step, a block of Salem limestone cut about 10 feet long, 1-foot tread and 7-inch rise, in front of the 16th Street entrance of the Baptist Memorial Church at 16th Street and Columbia Road, Washington, D. C. The type specimen is the stout, reversed U-shaped alga, approximately 30 in. long and .75 in. diameter, appearing in the right half of a 3-foot section on the left hand portion of the stone block. It is illustrated in Fig. 1, as a, b, c, grouped with portions of other algae of the same species and in Fig. 6.

Classification and Occurrence.—These fossil algae probably belong to the class *Chlorophyceae*, order *Siphonales* and family *Siphoneae*, and represent completely calcified rope-like remains

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EXPLANATION OF PLATE

Fig. 1. Sketch of groups of fossil algae visible on the weathered, flat, top face of the next to lowest step, a block of Salem limestone, in front of the 16th Street entrance of the Baptist Memorial Church of Washington, D.C. Portion of step illustrated is a 3 ft. long section at left end. The alga a, b, c shown in Fig. 1, approximately 30 in. long and .75 in. diameter, is the genotype of GLOBULINEA n. gen. Ulke, and specific type of *G. gigantea*, Ulke, n. sp.

Fig. 2. Sketch of a long and slender "rope and bead-like" alga (a to g) of a variety which I have named *Globulinea gigantea* var. *catenaeformis*, visible on the top slab of Salem limestone of the wall on 16th street, between Allison and Buchanan, in Wash. D.C., the particular stone being the 7th, S. of the main entrance to Crandall's residence. This variety differs from the above type species in being slender (3/16 to $\frac{1}{4}$ in diam), in usually lacking a continuous stem sheath, and in its branching habit. Were it not for the occurrence of somewhat intermediate forms, this variety, catenaeformis, might well be considered a valid new species.

Fig. 3. Sketch of an alga (a, b, c) with several short branches, on 5th capstone, N. of Allison, on 16th street.

Fig. 4. Sketch of a young branching alga, lacking septa, on 7th step, 38 in. fr. left end, front Columbia St. entrance, Bapt. Mem. Ch.

Fig. 5. Algal stem, with possible fruiting body, on step shown in Fig. 1.

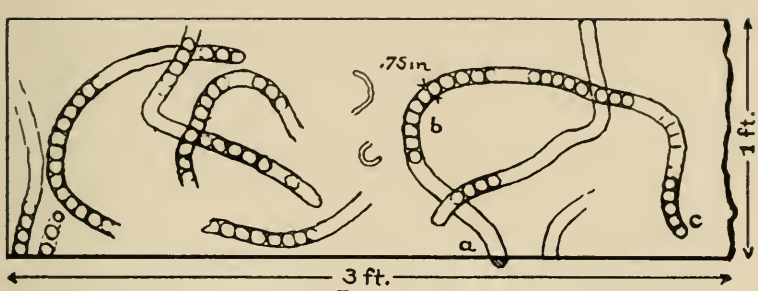


Fig.1.

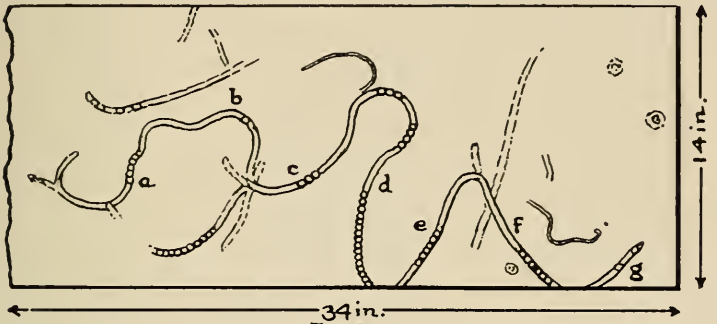


Fig.2.

Fig.3.

Fig.4

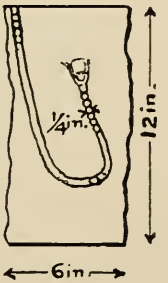
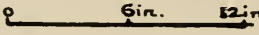


Fig.5.

All figures are drawn to scale: 1/8 in = 1 in. U. del.



of a lime-secreting, sparsely branched marine alga in which the thallus or stem is not at first divided by transverse septa. All of the original softer parts of the alga, filaments or stems, branches and algal cells, have evidently either been replaced, or incrusted, by calcareous matter. The algae, or their fragments, together with macerated shell matter, containing crinoid stem joints and numerous bryozoan remains, now constituting Salem limestone, were apparently deposited on shallow shores. (See literature cited by Professor Robert R. Shrock (1).)

My attention was first directed in 1934 to these fossils, which were at that time locally known as "vertebral back bones," and then, late in 1935, to the article written by Professor Shrock entitled: "Probable Worm Castings ('Coprolites') in the Salem limestone of Indiana" and included in "Invertebrate Paleontology" by Twenhofel and Shrock (2).

These authors received my evidence as to the algal nature of these fossils late in 1935 and in 1937 (see literature, note 3), and my suggestion that they be referred to the lime-secreting *Polysiphonia*, which, however, are of relatively very small size, and much branched forms. I now believe that *Cymopolia* (fam. *Siphoneae*, which includes *Diplopora*, *Gyroporella* and *Dactylopora*) is the genus nearest to *Globulinea*, as illustrated in Fig. 509 of Haas: "Die Leitfossilien," but which former is distinguished from the new genus by its numerous whorled, bifurcating or compound branches, lack of a stem sheath, relatively minute size, and much more recent geological age.

My reasons for favoring algal, and not annelid origin, for these fossils in short are the following: 1. Where best developed the markings almost always lie flat and parallel to the stone bedding planes, and not transverse thereto. 2. The material inside the stalks (or rods) and beads is essentially like the surrounding granular limestone. 3. Stalks and beads alike are separated from the surrounding rock by a tiny groove, suggesting that there was once some sort of a cell wall around them. 4. In some instances the "rods" bend back at an acute angle, in a bend which a worm could hardly make. 5. Some of the stalks fork, or branch, as in the var. *catenaeformis*, such normal power of branching being unique among the worms, and as far as I know, only observed in the tiny annelid *Syllis ramosa*, found living in "glass sponges" in Eastern seas. 6. Small lobate,

as well as foliate, long and wavy markings associated with the "rod and bead" structures, suggest the fronds of algae. 7. Rarely the "beads" decrease in size in one direction, as in an algal branch.

Distribution.—Blocks of Salem limestone, with these fossil algae plainly showing on their weathered surfaces, are com-

Photograph of type specimen in Salem limestone. The differences shown in diameter are due to the position of the camera.

monly used as side panels, steps, building stone, wall slabs and the like, on public and private edifices throughout the United States. In the city of Washington good exposures may be seen on the entrance steps of the Baptist Memorial Church, located at the N. E. corner of 16th Street and Columbia Road, on the capstones and covering slabs of the garden and lawn walls on 16th Street between Allison and Buchanan Streets, on wall panels on the 10th Street side of the Internal Revenue Building,

and on the roof floor railings of the new building of the Interior Department. Other similar localities, cited by Professor Shrock (2), are in Madison, Wisconsin, Chicago, Illinois, and Bloomington and Bedford, Indiana.

Pertinent Literature.—(1) E. R. Cumings et al., "Fauna of the Salem limestone," 30th Ind. Rept., 1905, p. 1199.—J. W. Beede et al., "Geology of the Bloomington Quadrangle," 39th Ind. Rept., 1915, pp. 204–206, E. R. Cumings, "Nomenclature and Description of the geological formations of Indiana," Handbook of Indiana Geology, Pt. IV, 1922, p. 504.

(2) R. R. Shrock, "Probable worm castings ('coprolites') in the Salem limestone of Indiana," Proc. Ind. Acad. Sci. for 1934 (1935), Vol. 44, pp. 174–175, Figs. 1A–C, included in "Invertebrate Paleontology," which appeared in the fall of 1935, by W. H. Twenhofel and R. R. Shrock, McGraw-Hill Book Company, Inc., 1935, p. 137, Fig. 43A.

(3) R. R. Shrock, "Fossil Algae from the Salem limestone (Indiana Building Stone) of Indiana," Science **87**, 2263, pages 438–439, May 13, 1938.

(4) Hyppolyt J. Haas: "Die Leitfossilien," Veit & Comp., Leipzig, 1887, pp. 283–284, and Fig. 509. Also Strasburger et als., "A Textbook of Botany," Macmillan and Co., Ltd., London, 1912, p. 363.

(5) Report of Voyage of H. M. S. *Challenger* (during the years 1873–76), Zoology, Vol. XII. Text, pp. 198–205. Plate XXXI. Fig. 1.

Washington, D.C.